1   1.   Apparatus for configuration independent simulation of network layer conditions in

2   a simulated network that transmits data packets between a DUT and another

3   component, the apparatus comprising:

4   a network layer verification mechanism connected between the DUT and

5   the other component, the network layer verification mechanism having a storage

6   and a plurality of methods for selectively forwarding data packets between the

7   DUT and the other component or for selectively storing data packets moving

8   between the DUT and the other component; and

9   an API interface for invoking the methods to simulate conditions that can

10   occur in the network, including dropped packets, duplicate packets, corrupted

11   packets, out-of-order packets and delayed packets.

    2.   The apparatus of claim 1 wherein the network layer verification mechanism is

2   implemented as a specialized object written in an HVL.

1   3.   The apparatus of claim 2 wherein the object includes internal storage in the form

2   of an associative array and a plurality of methods that allow packets received by

3   the object to be selectively forwarded through the object, temporarily stored in

4   the object or the packet data to be corrupted.

1   4.   The apparatus of claim 1 wherein the network layer verification mechanism

2   comprises a packet ingress section and a packet egress section.

1   5.   The apparatus of claim 4 wherein the API interface includes a method for

2   transmitting packets between the packet ingress section and the packet egress

3   section.

1   6.   The apparatus of claim 4 wherein the API interface comprises a method for
2   transmitting packets between the packet ingress section and the storage.

1   7.   The apparatus of claim 4 wherein the API interface comprises a method for
2   transmitting a packet stored in the storage to the packet egress section.

1   8.   The apparatus of claim 4 wherein the API interface comprises a method for
2   retrieving a packet stored in the storage.

1   9.   The apparatus of claim 4 wherein the API interface comprises a method for
2   modifying a data packet received at the ingress section.

1   10.   The apparatus of claim 9 wherein the API interface comprises a method for
2   restoring a modified data packet in the storage.

1   11.   A method for configuration independent simulation of network layer conditions in
2   a simulated network that transmits data packets between a DUT and another
3   component, the method comprising:
4   (a)   creating a network layer verification mechanism having a storage and a
5   plurality of methods for selectively forwarding data packets between the
6   DUT and the other component or for selectively storing data packets
7   moving between the DUT and the other component;
8   (b)   connecting the network layer verification mechanism between the DUT
9   and the other component; and
10   (c)   invoking the methods with an API interface to simulate conditions that can
11   occur in the network, including dropped packets, duplicate packets,
12   corrupted packets, out-of-order packets and delayed packets.

1   12.   The method of claim 11 wherein step (a) comprises implementing the network
2   layer verification mechanism as a specialized object written in an HVL.

1   13.   The method of claim 12 wherein step (a) comprises creating the object with
2   internal storage in the form of an associative array and a plurality of methods that
3   allow packets received by the object to be selectively forwarded through the
4   object, temporarily stored in the object or the packet data to be corrupted.

1   14.   The method of claim 11 wherein step (a) comprises receiving packets at a packet
2   ingress section of the network layer verification mechanism and transmitting
3   packets from a packet egress section of the network layer verification
4   mechanism.

1   15.   The method of claim 14 wherein the API interface includes a method for
2   transmitting packets between the packet ingress section and the packet egress
3   section.

1   16.   The method of claim 14 wherein the API interface comprises a method for
2   transmitting packets between the packet ingress section and the storage.

1   17.   The method of claim 14 wherein the API interface comprises a method for
2   transmitting a packet stored in the storage to the packet egress section.

1   18.   The method of claim 14 wherein the API interface comprises a method for
2   retrieving a packet stored in the storage.

1   19.   The method of claim 14 wherein the API interface comprises a method for
2   modifying a data packet received at the ingress section.

1   20.   The method of claim 19 wherein the API interface comprises a method for
2   restoring a modified data packet in the storage.

1   21.   A computer program product for configuration independent simulation of network
2   layer conditions in a simulated network that transmits data packets between a
3   DUT and another component, the computer program product comprising a
4   computer usable medium having computer readable program code thereon,
5   including:
6   (a)   program code that creates a network layer verification mechanism having
7   a storage and a plurality of methods for selectively forwarding data
8   packets between the DUT and the other component or for selectively
9   storing data packets moving between the DUT and the other component;
10   (b)   program code that connects the network layer verification mechanism
11   between the DUT and the other component; and
12   (c)   an API interface that invokes the methods to simulate conditions that can
13   occur in the network, including dropped packets, duplicate packets,
14   corrupted packets, out-of-order packets and delayed packets.

1   22.   The computer program product of claim 21 wherein the program code that
2   creates a network layer verification mechanism comprises program code that
3   implements the network layer verification mechanism by instantiating a as a
4   specialized object written in an HVL.

1   23.   The computer program product of claim 22 wherein the program code that
2   creates a network layer verification mechanism comprises program code that
3   instantiates the object with internal storage in the form of an associative array
4   and a plurality of methods that allow packets received by the object to be
5   selectively forwarded through the object, temporarily stored in the object or the
6   packet data to be corrupted.

1   24.   The computer program product of claim 21 wherein the program code that
2   creates a network layer verification mechanism comprises program code that
3   creates a packet ingress section of the network layer verification mechanism and

4   program code that creates a packet egress section of the network layer

5   verification mechanism.

1   25.   The computer program product of claim 24 wherein the API interface includes a

2   method for transmitting packets between the packet ingress section and the

3   packet egress section.

1   26.   The computer program product of claim 24 wherein the API interface comprises

2   a method for transmitting packets between the packet ingress section and the

3   storage.

1   27.   The computer program product of claim 24 wherein the API interface comprises

2   a method for transmitting a packet stored in the storage to the packet egress

3   section.

1   28.   The computer program product of claim 24 wherein the API interface comprises

2   a method for retrieving a packet stored in the storage.

1   29.   The computer program product of claim 24 wherein the API interface comprises

2   a method for modifying a data packet received at the ingress section.

1   30.   The computer program product of claim 29 wherein the API interface comprises

2   a method for restoring a modified data packet in the storage.

1   31.   A computer data signal embodied in a carrier wave for configuration independent

2   simulation of network layer conditions in a simulated network that transmits data

3   packets between a DUT and another component, the computer data signal

4   comprising:

5   (a)   program code that creates a network layer verification mechanism having

6   a storage and a plurality of methods for selectively forwarding data

7		packets between the DUT and the other component or for selectively
8		storing data packets moving between the DUT and the other component;
9	(b)	program code that connects the network layer verification mechanism
10		between the DUT and the other component; and
11	(c)	an API interface that invokes the methods to simulate conditions that can
12		occur in the network, including dropped packets, duplicate packets,
13		corrupted packets, out-of-order packets and delayed packets.